

Alana M. Parey

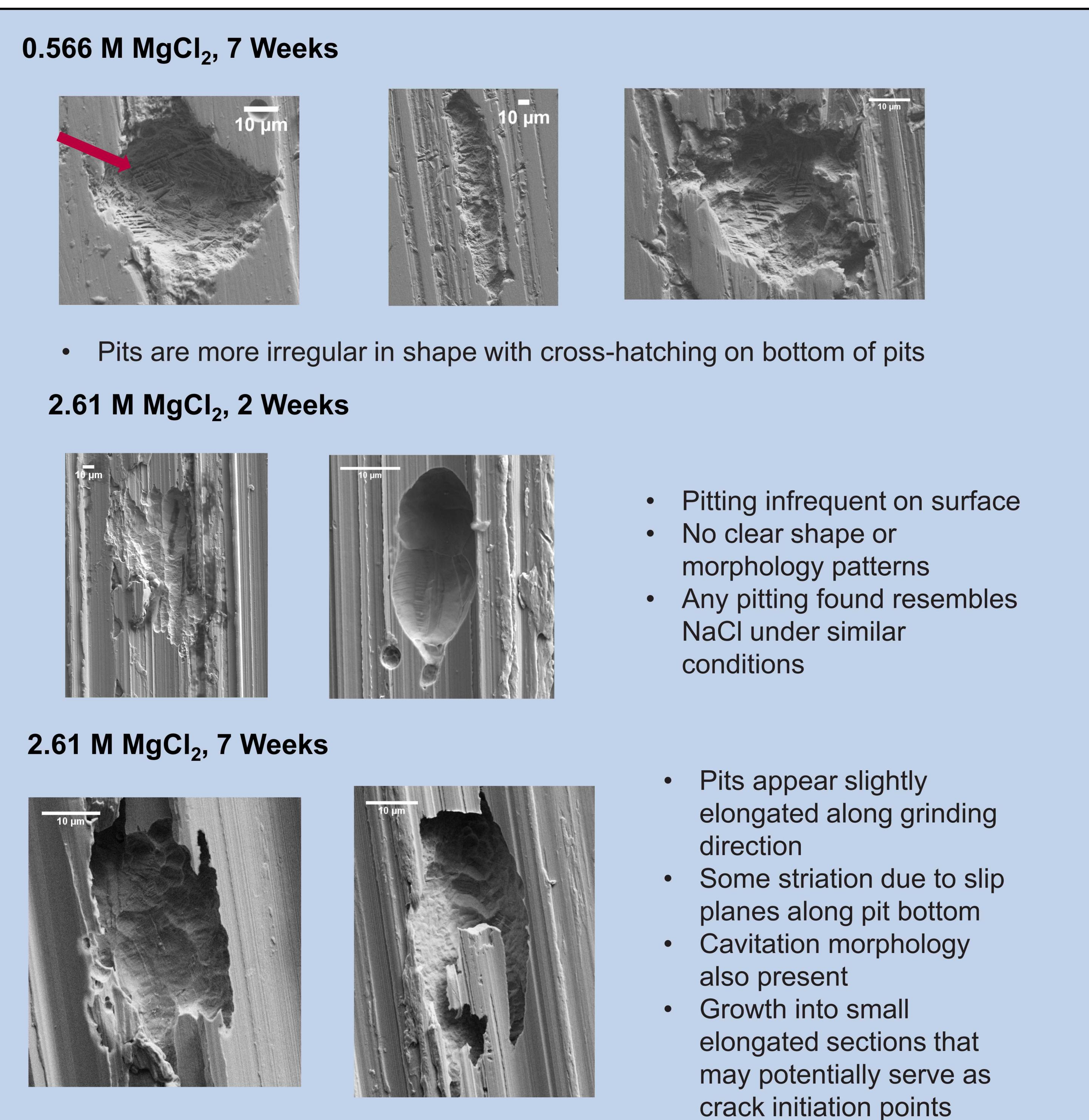
Fontana Corrosion Center, The Ohio State University
Storage and Transportation Technology, Sandia National Laboratories

EXPERIMENTAL SETUP AND DISCUSSION

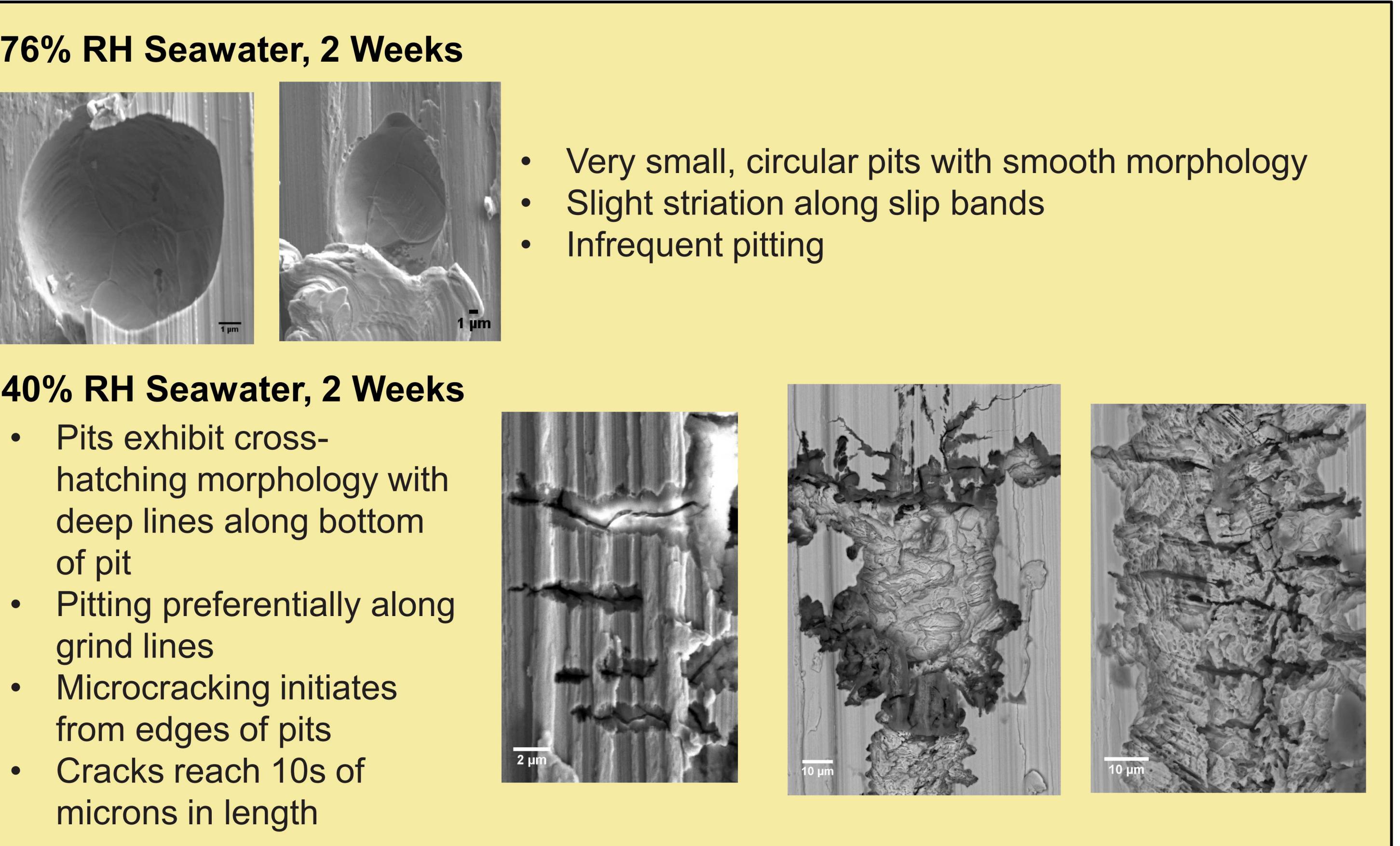
Full Immersion Exposures

- All exposures carried out at 35 °C on 1" x 2" coupons with a 120 grit finish

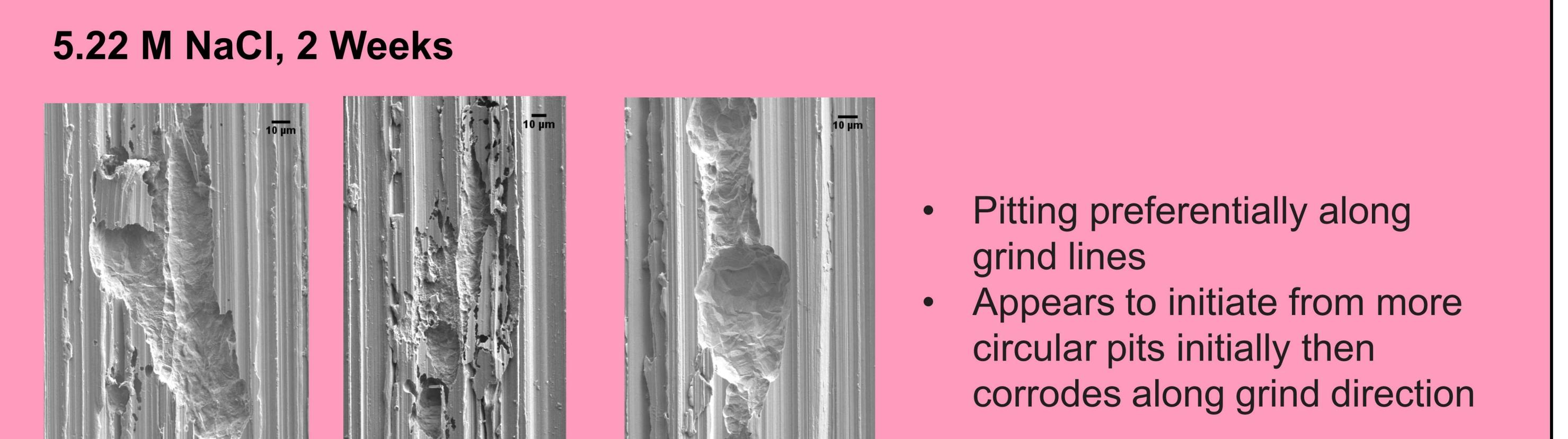
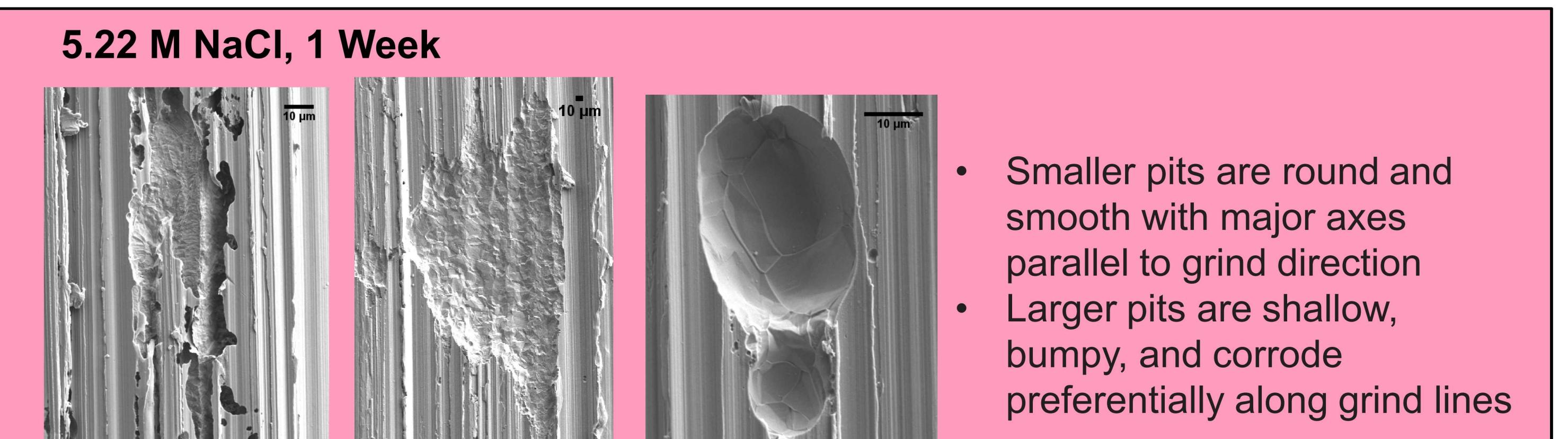
Salt Type	Concentration	Equivalent RH	Steel Type	Test Duration	Pitting Present	Microcracks Present
MgCl ₂	0.566 M	MgCl ₂ Concentration at 76% RH	304L	1 week	No	No
			304L	2 weeks	No	No
			304H	7 weeks	Yes	No
	2.61 M	Equivalent Chloride Concentration of NaCl at 76% RH Seawater	304L	1 week	No	No
			304L	2 weeks	Yes	No
			304H	7 weeks	Yes	No
NaCl	5.22 M	NaCl concentration at 76% RH Seawater	304L	1 week	Yes	No
Artificial Seawater	N/A	40% RH	304L	2 weeks	Yes	Yes
Artificial Seawater	N/A	76% RH	304L	2 weeks	Yes	No



Under full immersion conditions, cathodic area is maximized.



- Pitting in 2.61 M MgCl₂ resembles shape and morphology more of 5.22 M NaCl (equivalent chloride concentration) and 76% RH seawater (dominant species is 5.22 M NaCl) than that of 0.566 MgCl₂ (similar chemistries)
- 0.566 M MgCl₂ has the lowest chloride concentrations but exhibited cross-hatching morphology if pitting did occur
- Microcracking only seen under 40% RH conditions which could be caused by the presence or specific concentration of a currently unidentified species in the brine



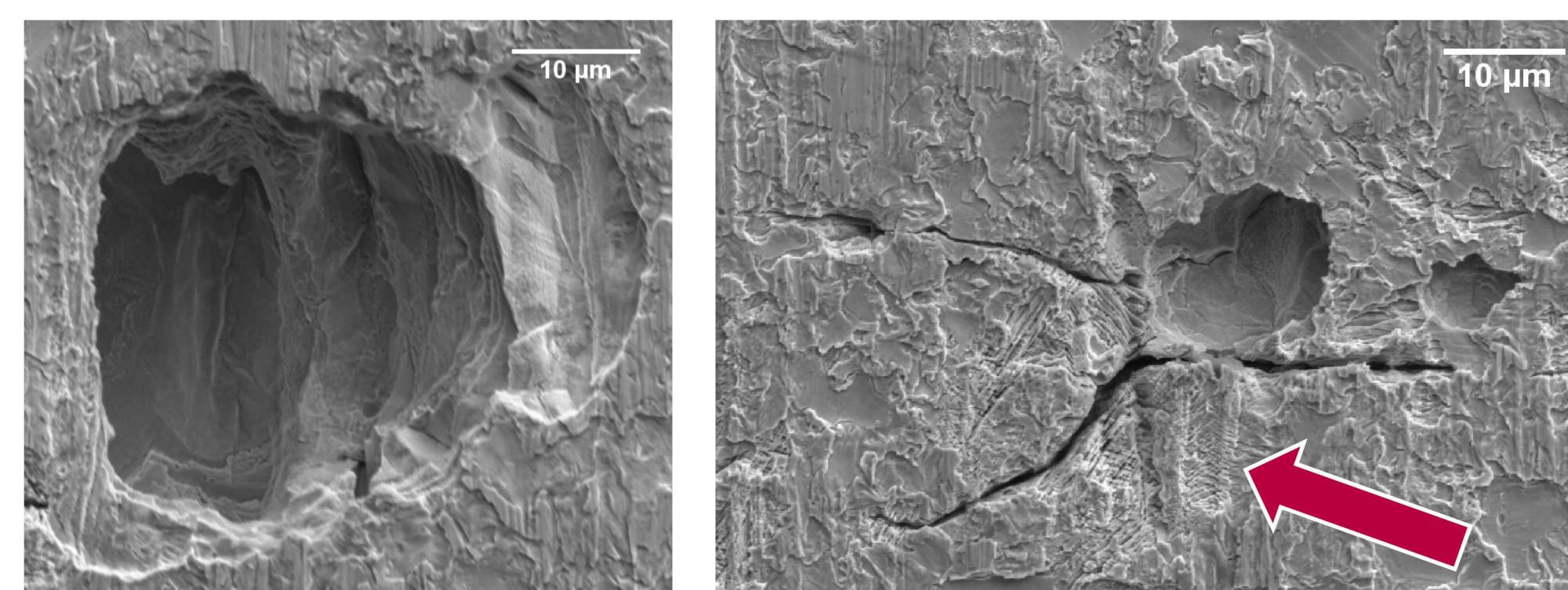
- Similar corrosion patterns to earlier exposure
- Smaller, more circular pits showing striation along slip planes at pit bottom

Tensile Bar Examination

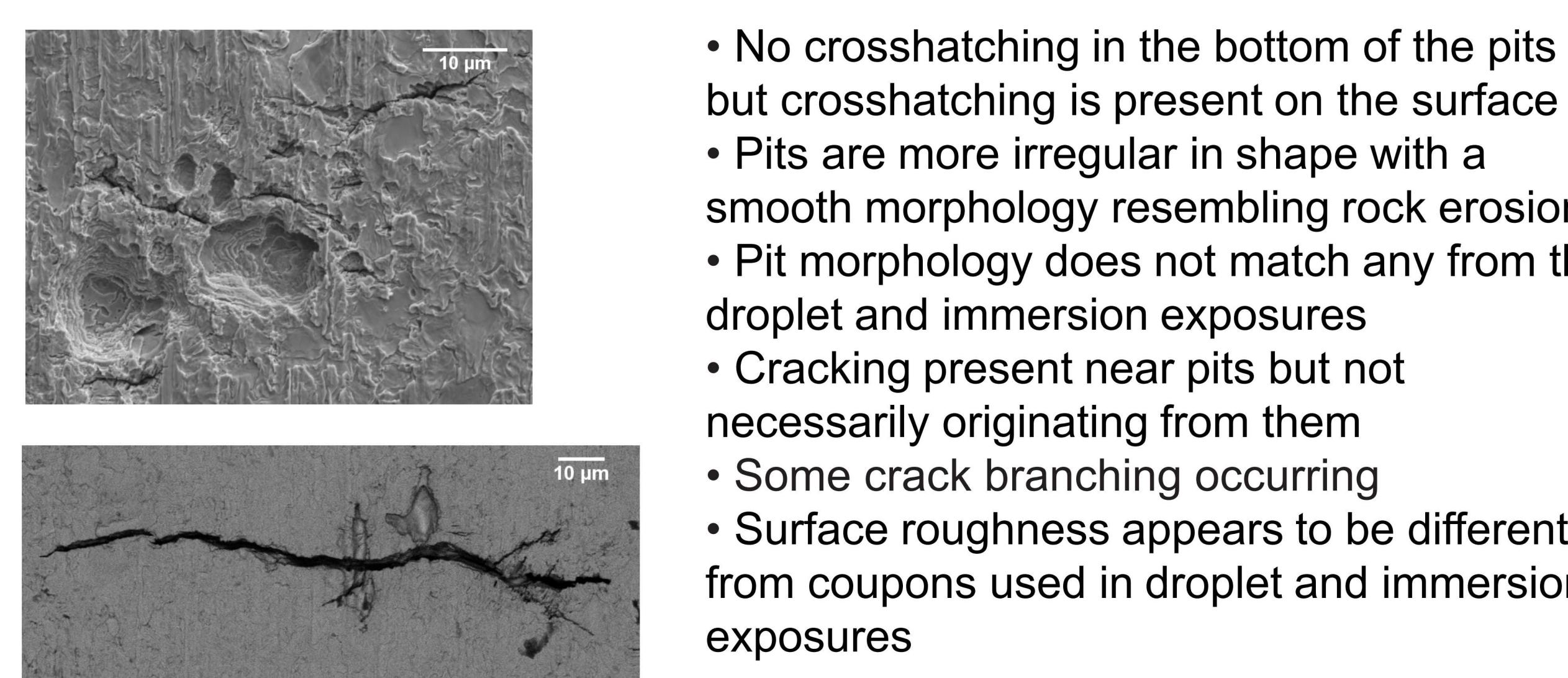
Broad Side

Conditions:

- Printed at 300 $\mu\text{g}/\text{cm}^2$ ASTM sea salt
- 6 months exposed at 35 °C and 40% RH
- Afterwards, 6 months pulled at a load of σ_y



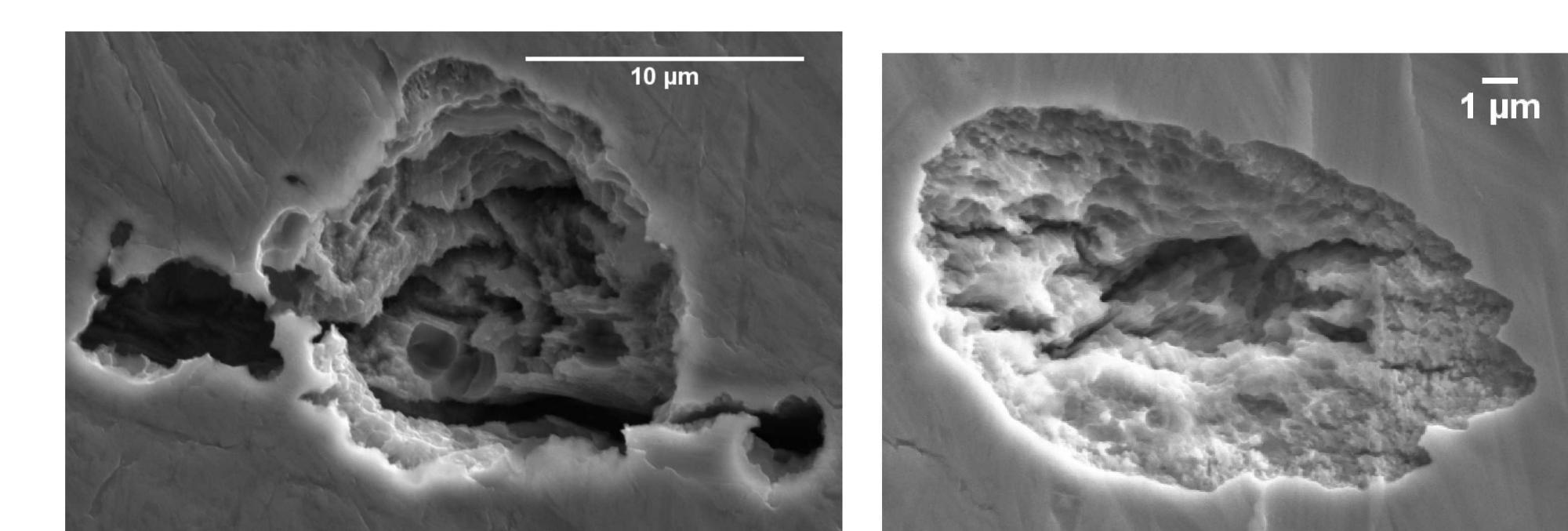
Pulling Direction



Narrow Side

Conditions:

- Printed at 300 $\mu\text{g}/\text{cm}^2$ ASTM sea salt
- 12 months exposed at 35 °C and 40% RH
- Afterwards, 6 months pulled at a load of σ_y



Pulling Direction

